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PONDEROSA PINE REPRODUCTION IN RELATION TO SEED SUPPLY AT CHALLENGE EXPERIMENTAL FOREST[1/]

By
Edward S. Corbett, Research Forester

ABSTRACT: Seed trees were selected in young-growth ponderosa pine to produce an estimated 25,000, 50,000, and 100,000 seeds per acre. A year after a good seed crop, ponderosa pine stocking in cutover plots was: 1,910, 4,020, and 4,820 seedlings per acre. Some additional regeneration of other species also occurred.

Preliminary findings from an experiment at the Challenge Experimental Forest indicate that on this favorable site about 3 to 6 seed trees per acre, chiefly ponderosa pine, are sufficient to reseed cutover areas where seedbeds have been prepared. In this study, which is part of a larger project, regeneration is being investigated in relation to three levels of seed production potential, 25,000, 50,000, and 100,000 seeds per acre. Estimated average seed production potential of dominant trees, according to diameter at breast height, was the basis for selecting seed trees.[2/]

The stands in which the studies are being made are about 100 years old, and are composed predominantly of ponderosa pine with small admixtures of Douglas-fir, white fir, sugar pine, and incense-cedar. Compartments 10 to 25 acres in size were logged to the 3-seed-tree levels in 1959 and replicated again in 1960. The stands averaged 50,000 board feet (Scribner rule) to the acre. Between 75 and 90 percent of this volume was removed in the cuttings. Eighty-one percent of the remaining seed trees were ponderosa pine; Douglas-fir made up 12 percent, sugar pine 6 percent, and white fir 1 percent (table 1).

Logging slash was piled after logging and burned when the fire danger was low. Low quality or diseased hardwoods over 12 inches d.b.h. were girdled and poisoned. Brush and small hardwoods were piled along with the logging slash

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1/ In cooperation with the Soper-Wheeler Company.

2/ Fowells, H. A., and Schubert, G. H. Seed crops of forest trees in the pine region of California. U.S. Dept. Agr. Tech. Bul. 1150. 48 pp., illus. 1956.

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and burned. As a result, the cutting areas were well scarified and much mineral soil was exposed. On half of the 1959 cutting, slash piling was postponed according to plan until the first good seed year. This happened in 1960. Consequently, seedbed surfaces on half of the 1959 cutting were as freshly prepared as on the 1960 cutting. Slash from the delayed portion of the 1959 cutting and from all of the 1960 cutting could not be burned safely until January 1961. Because most seeds of the species under study fall during the autumn months, relatively few if any seeds were available for germination in 1961 on the spots burned in January the same year.

A series of milacre reproduction plots was laid out in 2 blocks within each compartment to obtain stocking[3/] estimates for ponderosa pine seedlings with an accuracy of ± 5 percent, 2 chances out of 3.

Table 1.--Number of seed trees left and their basal area by cutting treatments

Seed production potentials in seeds per acre	Ponderosa pine only		All coniferous species[1/]	
	Number of seed trees per acre	Basal area per acre in sq. ft.	Number of seed trees per acre	Basal area per acre in sq. ft.
25,000	2.2	9.58	2.6	11.82
50,000	5.8	24.44	6.2	26.32
100,000	7.4	30.54	10.1	40.98

1/ Ponderosa pine, sugar pine, Douglas-fir, white fir.

Results

Few seeds were produced in 1959; however, good cone crops were noted on all species in 1960. Results of cone counts and seed trap data indicate about 60 percent of the estimated seed production potential was achieved in 1960. Although some older seedlings were present, only those which germinated in 1961 are reported in the discussion and tables which follow. Stocking estimates for ponderosa pine seedlings are accurate within ± 3.7 to 5.3 percent, 2 chances out of 3. Little difference was observed in stocking between the areas logged in 1959 and 1960. Consequently, the stocking data are combined data from both years of logging.

Stocking in July 1961 appeared to be generally satisfactory. The "100,000-seed" cuttings had the greatest number of ponderosa pine seedlings--4,820 per acre--and the best distribution as measured by stocking of milacres--86.4 percent. Numbers of seedlings and milacre stocking on the "50,000-seed" plots almost equaled these (table 2). The difference in stocked milacres between these treatments was not statistically significant. Some additional reseeding of other species also occurred. They raised total numbers of seedlings appreciably.

3/ A milacre plot is considered stocked if it contains 1 coniferous seedling.

Table 2.--Stocking of 1961 seedlings in relation to seed supply[1/]

Seed production potentials in seeds per acre	Ponderosa pine only: Milacres stocked	Ponderosa pine only: Seedlings per acre	All coniferous species[2/]: Milacres stocked	All coniferous species[2/]: Seedlings per acre
	Percent	Number	Percent	Number
25,000	63.0	1,910	68.8	2,440
50,000	84.4	4,020	85.9	4,240
100,000	86.4	4,820	87.0	5,400

1/ Stocking in July 1961.
2/ Ponderosa pine, sugar pine, Douglas-fir, white fir, incense-cedar.

The "25,000-seed" plots had somewhat less than half as many ponderosa pine seedlings (1,910 per acre), and milacre stocking of this species was 63 percent. Milacre stocking is significantly different at the 1 percent level from those on the two other treatments.

Discussion

The Challenge Experimental Forest is located in an area where, owing to deep, well drained soils and abundant precipitation, pine seedlings can become established more readily than where soil moisture conditions are less favorable. The seedbed preparation described earlier and a low rodent population[4/] appear to have played an important part in creating optimum conditions for seedling establishment. The 1-year delay in getting the 1959 compartments seeded did not seem to hamper the seedling "catch." The information gathered to date from the study does not indicate for how many more years seedbed conditions would remain favorable if the seed crops had been delayed for a longer period.

The stocking and seedling count figures for the 50,000- and 100,000-seed production treatments look very good for insuring a new stand of timber. The present stocking in the 25,000-seed production treatment area is adequate--if later mortality is not severe. Future mortality will almost certainly reduce the number of established seedlings 3 or 4 years from now in all treatment areas. But mortality should be low, parts of the stands will become excessively dense, and may require thinning. Although the primary objective of management is to produce ponderosa pine, the admixture of small numbers of other species is silviculturally desirable.

4/ File Report. Challenge Experimental Forest, 1961.